Space Weather Technical Forecast

Issued on Saturday, 20 January 2024 at 13:28 Local

This technical forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

Space Weather Forecast Headline: Chance of isolated M-class flares.

Analysis of Space Weather Activity over past 24 hours
Solar Activity: Low activity was observed, with one notable C-class flare, a long period C3.5 flare from the vicinity of AR3555 and AR3561 in the southeast quadrant. This may have produced an eruption, but further imagery is required to determine whether any CME left the Sun. There are 10 sunspots on the disc in total, with the largest regions AR3559 in the northeast and AR3555 in the southeast quadrant. These regions have not evolved significantly in the last 24 hours. AR3560 in the southeast appears simple, but is showing signs of increasing complexity. The remaining regions all appear stable and simple. A possible partial halo C<e has been observed emanating from the southeast of the solar disc on LASCO imagery, but this will need to be analysed to determine whether it has an Earth-directed component.

Solar Wind / Geomagnetic Activity: Solar winds observed at DSCOVR have been at slightly elevated levels, averaging between 400-450km/s. Density has been close to average. Total magnetic field strength was weak, with the north-south component varying weakly. Phi angle was predominantly positive (away from the Sun). Geomagnetic activity was Quiet to Unsettled.

Energetic Particles / Solar Radiation: GOES18 high energy (greater than 10MeV) proton flux was at background. GOES16 high energy (greater than 2MeV) electron flux was at background. The associated 24-hour fluence was well below the Active (1e8 integrated pfu) threshold on a steady trend. At 20/0000UTC 24-hour integrated fluence observation was 1.13e6 integrated pfu.

Four-Day Space Weather Forecast Summary
Solar Activity: Low activity is forecast, with a slight chance of an isolated M-class flare.

Solar Wind / Geomagnetic Activity: There are no Earth directed CMEs currently in the forecast. Solar wind speeds are forecast to perhaps reach elevated levels of around 500km/s either later on 20 January or early on 21 January due to the onset of a high speed stream. These speeds are then expected to decline through 22 and 23 January as the fast wind declines. Geomagnetic activity is forecast to be mainly Quiet to Unsettled, with a slight chance of Active intervals due to the onset of the high speed stream.

Energetic Particles / Solar Radiation: High energy proton flux is forecast to remain at background. The high energy electron flux is also expected to persist at background, with only a chance of rising to Moderate later in the period due to enhancements caused by the forecast high speed stream. The associated 24 hour fluence is expected to persist below the Active threshold.

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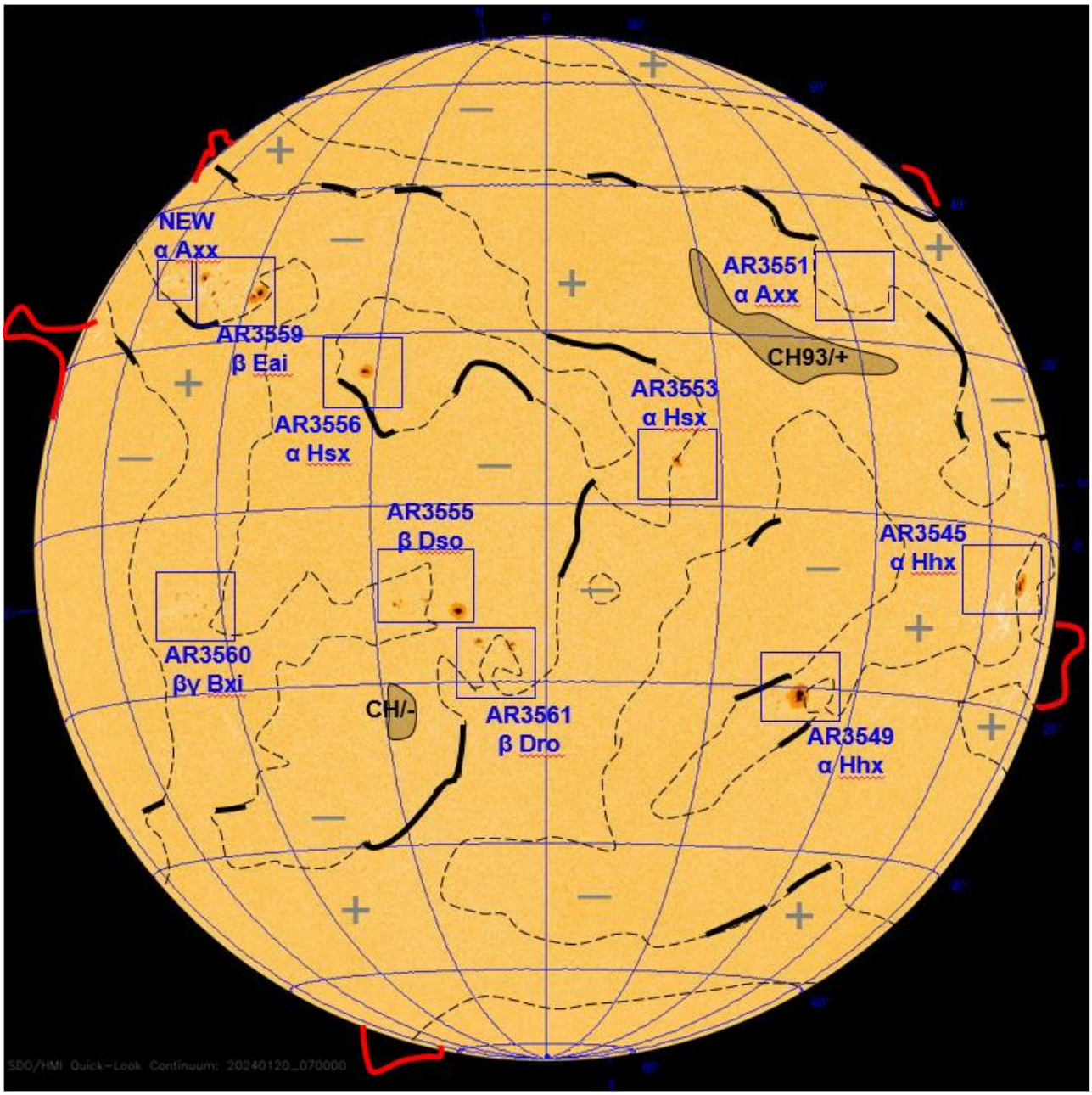
Figure 1. Solar Analysis Valid 20/.



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Key: Filament ___ , Prominence ___ , Magnetic Field Line - - - , Polarity +/-, Coronal Holes: Grey shaded area CHxx +/-, Sunspot groups 25xx - Mt Wilson α-β-βγ-βγδ and Zurich-McIntosh Axx etc.

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Geomagnetic Storms:
No Earth-directed CMEs have been observed. A possible partial halo appears to be far sided, but will be analysed once sufficient imagery becomes available.

Solar wind speeds are at slightly elevated levels, between 400-450km/s. A coronal hole high speed stream is forecast to connect with the Earth either late on 20 or during 21 January. However, due to the location high in the northern hemisphere and the positive polarity, both of which are unfavourable for strong connections, any response in the solar wind is expected to be muted. Any increase in winds are likely to also be muted, perhaps reaching 500km/s based on observations from the previous rotation, these then declining through 22 January.

Geomagnetic activity is forecast to be mainly Quiet to Unsettled, with a slight chance of Active intervals due to the connection with the weak coronal hole.

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	5	5	1	1
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

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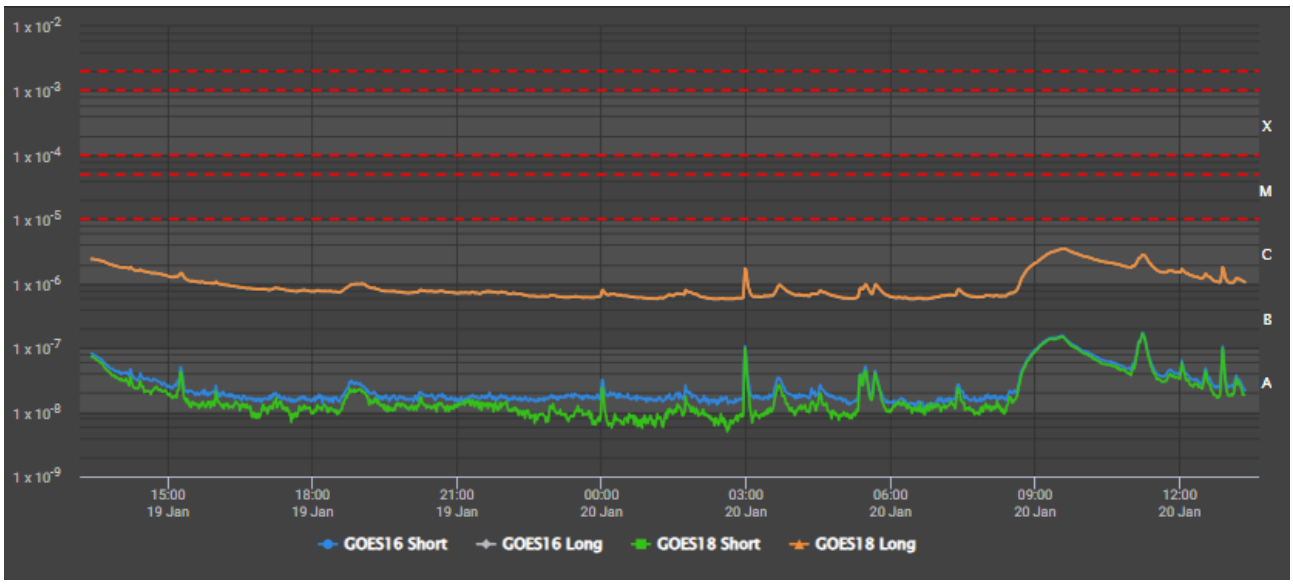
Radio Blackouts - X-Ray Flares:
Solar activity has been Low, with a recent notable long-period C-class flare from the vicinity of AR3555 and AR3561 in the southeast quadrant. The eruption may have produced a CME, although imagery is currently limited.

There are 10 sunspot regions in total on the visible disc, the largest of these is AR3559 close to the northeast limb. This along with the next largest region AR3555 have only evolved slowly through the last 24 hours. AR3560 in the southeast quadrant is less imposing, but appears to be emerging as a ring structure with a relatively complex beta-gamma configuration. This will be monitored for further developments. Low activity is expected to continue.

X Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 M Class	No	30	30	35	40
Very Active	R3 to R5 X Class	No	1	1	1	1

Figure 2: GOES 16 X-Ray flux



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Solar Radiation Storms - (High Energy Protons):

GOES18 high energy (greater than 10MeV) proton flux is currently at back, with only a very slight chance of rising and reaching the S1 Minor Radiation Storm threshold in response to any notable flares.

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	No	2	2	2	2
Very Active	≥ S3 *	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

High Energy Electrons Event (≥ 2MeV):

High energy electron flux (greater than 2MeV) is at background levels. A slight enhancement to Moderate levels on diurnal maximums is possible due to a forecast high speed stream connection on 20 or 21 January, with these elevated conditions then slowly declining once the coronal hole high speed stream declines.

Electron fluence levels are well below the Active threshold (1e8 integrated pfu). As there are no significant inputs to the radiation belts forecast, the Active threshold is not expected to be reached.

GEO Electron Environment Probability (Exceedance)	Level (cm^{-2} sr^{-1} day^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ 2 MeV ≥ $1x10^8$	No	1	1	1	1
Very Active	≥ 2 MeV ≥ $1x10^9$	No	1	1	1	1

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